

WHAT IS CLAIMED IS:

1. An image processing method of multiplexing a code representing additional information with image information, comprising:
 - 5 a shape setting step of setting code shape information on the basis of a feature of the image information;
 - 10 a quantization condition determination step of determining a quantization condition of a pixel of interest in the image information on the basis of the code shape information and the additional information; and
 - 15 a quantization step of quantizing the pixel of interest on the basis of the quantization condition.
- 20 2. The method according to claim 1, wherein in said quantization step, quantization by pseudo-halftoning processing is executed.
- 25 3. The method according to claim 2, wherein in said quantization step, quantization by error diffusion is executed.
4. The method according to claim 1, wherein the feature of the image information is a density at a flat portion.
5. The method according to claim 1, wherein the code shape information represents a dot pattern.
- 25 6. The method according to claim 5, wherein in said

shape setting step, the code shape information is selected from a plurality of dot patterns prepared in advance.

7. The method according to claim 6, wherein the 5 plurality of dot patterns prepared in advance can appear at a flat portion of the image information as a quantization result in said quantization step.

8. The method according to claim 7, wherein in said 10 shape setting step, a dot pattern is selected, which does not appear as the quantization result in a uniform flat image based on an average pixel value around the pixel of interest.

9. The method according to claim 8, wherein in said 15 shape setting step, a dot pattern is selected in which the number of on- or off-dots in a smaller number has the number of dots larger than that of the dot pattern which appears in the uniform flat image as the quantization result.

10. The method according to claim 6, further 20 comprising a color component detection step of detecting a color component of a code attachment target in the image information, wherein

in said shape setting step, the dot pattern is selected on the basis of the color component of the 25 image information.

11. The method according to claim 10, wherein in said

shape setting step comprises setting a size of the dot pattern on is set the basis of the color component.

12. The method according to claim 6, further comprising an edge detection step of detecting an edge 5 portion of the image information, wherein

in said shape setting step, the dot pattern is selected on the basis of whether the edge portion is contained in pixels around the pixel of interest.

13. The method according to claim 12, wherein in said 10 shape setting step, a first dot pattern is selected when the edge portion is not included in the pixels around the pixel of interest, and a second dot pattern having a denser dot layout than the first dot pattern is selected when the edge portion is included.

15 14. An image processing apparatus for multiplexing a ← code representing additional information with image information, comprising:

holding means for holding a plurality of code shape information;

20 quantization condition determination means for determining a quantization condition of a pixel of interest in the image information on the basis of the additional information and the code shape information selected from said holding means on the basis of a 25 feature of the image information; and

quantization means for quantizing the pixel of

interest on the basis of the quantization condition.

15. A recording medium which records a program code of an image processing method of multiplexing a code representing additional information with image

5 information, the program code comprising:

 a code of the shape setting step of setting code shape information on the basis of a feature of the image information;

 a code of the quantization condition
10 determination step of determining a quantization condition of a pixel of interest in the image information on the basis of the code shape information and the additional information; and

 a code of the quantization step of quantizing the
15 pixel of interest on the basis of the quantization condition.

16. An image processing apparatus for multiplexing additional information with image information, comprising:

20 first input means for inputting the image information;

 second input means for inputting the additional information;

 quantization means for multiplexing the
25 additional information on the image information and executing pseudo-halftoning processing so as to express

the additional information by a set of minimum number
of pixels readable by an image reading apparatus in
consideration of resolution of an image output
apparatus for outputting the image information as an
5 image and resolution of the image reading apparatus for
reading the image output from the image output
apparatus; and

10 output means for outputting image data processed
by pseudo-halftoning processing by said quantization
means.

17. The apparatus according to claim 16, wherein the
pseudo-halftoning processing is executed by error
diffusion.

18. The apparatus according to claim 16, wherein the
15 pseudo-halftoning processing is executed by dithering.

19. The apparatus according to claim 16, wherein the
set of pixels which is generated by said quantization
means to express the additional information is formed
from continuous pixels having a first quantization
20 value, the continuous pixels having the first
quantization value having a size determined in
consideration of the resolution of the image reading
apparatus.

20. The apparatus according to claim 19, wherein said
25 quantization means generates, adjacent to the set of
continuous pixels having the first quantization value, a

set of continuos pixels having a second quantization value for compensating a density expressed by the set of continuos pixels having the first quantization value so as to maintain an average density of image

5 information in a neighboring region of pixels on which the additional information is to be multiplexed.

21. The apparatus according to claim 20, wherein the additional information multiplexed on the image information is expressed by a combination of the set of

10 continuous pixels having the first quantization value and the set of continuous pixels having the second quantization value.

22. The apparatus according to claim 16, wherein the additional information is attached to one of a

15 plurality of color components of the image information.

23. The apparatus according to claim 22, further comprising selection means for checking a density of a neighboring pixel near an attachment position of the additional information in units of the plurality of

20 color components and selecting, on the basis of an average density of the neighboring pixels, a color component hard to visually recognize from the plurality of color components as an image information of the image information, with which the additional

25 information is to be multiplexed.

24. The apparatus according to claim 22, further

comprising classification means for, when said second input means inputs a plurality of additional information, classifying the additional information so as to multiplex the plurality of additional information
5 with different color components of the image information.

25. An image processing apparatus for reading an image having additional information multiplexed thereon and separating the additional information, comprising:

10 read means for reading the image;
detection means for detecting a position where the additional information is multiplexed in the image;
and

separation means for specifying the additional
15 information multiplex position of the image on the basis of a detection result from said detection means and separating the additional information from the specified position.

26. The apparatus according to claim 25, wherein said
20 detection means reads a predetermined dot pattern printed in a predetermined region of the image to detect the additional information multiplex position.

27. The apparatus according to claim 25, wherein said
25 detection means regards a position defined in accordance with a predetermined image format as the additional information multiplex position.

28. The apparatus according to claim 25, wherein said read means comprises a scanner.

29. The apparatus according to claim 25, wherein said separation means comprises measurement means for

5 measuring an average density value near the specified
additional information multiplex position and a
difference between a maximum value and a minimum value
of a local average pixel value, and extracts a value of
a code representing the additional information on the
10 basis of the average density value and difference
measured by said measurement means.

30. The apparatus according to claim 29, wherein said separation means comprises selection means for selecting one of a plurality of threshold values on the basis of the average density value, and extracts the value of the code by comparing the threshold value selected by said selection means with the difference.

31. An image processing method of multiplexing ←
additional information with image information and
20 separating the additional information from an image
having the additional information multiplexed,
comprising:

a first input step of inputting the image information;

25 a second input step of inputting the additional
information:

10 a quantization step of multiplexing the additional information with the image information and executing pseudo-halftoning processing so as to express the additional information by a set of minimum number
5 of pixels readable by an image reading apparatus in consideration of resolution of an image output apparatus for outputting the image information as an image and resolution of the image reading apparatus for reading the image output from the image output
10 apparatus;

an output step of forming an image on the basis of image data processed by pseudo-halftoning processing and outputting the image;

15 a read step of reading the image;
a detection step of detecting a position where the additional information is multiplexed in the image; and

20 a separation step of specifying the additional information multiplex position of the image on the basis of a detection result in said detection step and separating the additional information from the specified position.

32. The method according to claim 31, wherein the set of pixels which is generated in said quantization step
25 to express the additional information is formed from continuous pixels having a first quantization value,

008260-42272860

the continuous pixels having the first quantization value having a size determined in consideration of the resolution of the image reading method.

33. The method according to claim 32, wherein said
5 the quantization step generates, adjacent to the set of continuos pixels having the first quantization value, a set of continuos pixels having a second quantization value for compensating a density expressed by the set of continuos pixels having the first quantization value
10 so as to maintain an average density of image information in a neighboring region of pixels on which the additional information is to be multiplexed.

34. The method according to claim 33, wherein the additional information multiplexed on the image
15 information is expressed by a combination of the set of continuous pixels having the first quantization value and the set of continuous pixels having the second quantization value.

35. The method according to claim 31, wherein said
20 separation step comprises a measurement step of measuring an average density value near the specified additional information multiplex position and a difference between a maximum value and a minimum value of a local average pixel value, and a value of a code
25 representing the additional information is extracted on the basis of the average density value and difference

measured in said measurement step.

36. The method according to claim 35, wherein said separation step comprises a selection step of selecting one of a plurality of threshold values on the basis of 5 the average density value, and the value of the code is extracted by comparing the threshold value selected in said selection step with the difference.

37. A computer-readable memory which stores a program ← for executing image processing of multiplexing 10 additional information with image information or/and separating the additional information from an image having the additional information multiplexed, said program comprising:

15 a code for executing first input processing of inputting the image information;

a code for executing second input processing of inputting the additional information;

20 a code for executing processing of multiplexing the additional information with the image information and executing pseudo-halftoning processing so as to express the additional information by a set of minimum number of pixels readable by an image reading apparatus in consideration of resolution of an image output apparatus for outputting the image information as an 25 image and resolution of the image reading apparatus for reading the image output from the image output

apparatus;

a code for executing processing of forming an image on the basis of image data processed by pseudo-halftoning processing and outputting the image;

5 a code for executing read processing of reading the image;

a code for executing detection processing of detecting a position where the additional information is multiplexed in the image; and

10 a code for executing separation processing of specifying the additional information multiplex position of the image on the basis of a detection result in the detection processing and separating the additional information from the specified position.

15 38. An image processing method of multiplexing ← additional information with image information, comprising:

a first input step of inputting the image information;

20 a second input step of inputting the additional information;

a quantization step of multiplexing the additional information with the image information and executing pseudo-halftoning processing so as to express 25 the additional information by a set of minimum number of pixels readable by an image reading apparatus in

consideration of resolution of an image output apparatus for outputting the image information as an image and resolution of the image reading apparatus for reading the image output from the image output apparatus; and

an output step of forming an image on the basis of image data processed by pseudo-halftoning processing in said quantization step and outputting the image;

39. A computer-readable memory which stores a program ←
10 for executing image processing of multiplexing additional information with image information, said program comprising:

a code for executing first input processing of inputting the image information;

15 a code for executing second input processing of inputting the additional information;

a code for executing quantization processing of multiplexing the additional information with the image information and executing pseudo-halftoning processing 20 so as to express the additional information by a set of minimum number of pixels readable by an image reading apparatus in consideration of resolution of an image output apparatus for outputting the image information as an image and resolution of the image reading apparatus for reading the image output from the image output apparatus; and .

a code for executing output processing of forming an image on the basis of image data processed by pseudo-halftoning processing by quantization processing and outputting the image.

5 40. The apparatus according to claim 16, wherein the
additional information is expressed by a color
component for which a set of pixels is generated by
said quantization means.

41. An image processing apparatus, comprising:

10 input means for inputting an image;
 attachment means for attaching predetermined
information to the image input by said input means; and
 output means for outputting the image to which
the predetermined information is attached by said
15 attachment means.

wherein said attachment means adaptively attaches the predetermined information on the basis of resolution at which the image output by said output means is read.

20 42. An image processing method, comprising:
an input step of inputting an image;
an attachment step of attaching predetermined
information to the image input in said input step; and
an output step of outputting the image to which
25 the predetermined information is attached in said
attachment step,

wherein said attachment step adaptively attaches the predetermined information on the basis of resolution at which the image output in said output step is read.

5 43. A computer-readable memory which stores a program for executing image processing, said program comprising:

 a code for executing input processing of inputting an image;

10 a code for executing attachment processing of attaching predetermined information to the image input by the input processing; and

 a code for executing output processing of outputting the image to which the predetermined

15 information is attached by the attachment processing,

 wherein the attachment processing comprises adaptively attaches the predetermined information on the basis of resolution at which the image output in the output processing is read.

20 44. An image processing apparatus for attaching predetermined information to image information, comprising:

 input means for inputting the image information; and

25 attachment means for attaching a plurality of different predetermined information to different color

components of the image information input by said input means, respectively.

45. An image processing method of attaching predetermined information to image information,
5 comprising:

an input step of inputting the image information;
and

10 an attachment step of attaching a plurality of different predetermined information to different color components of the image information input in said input step, respectively.

46. A computer-readable memory which stores a program for executing image processing of attaching predetermined information to image information, said
15 program comprising:

a code for executing input processing of inputting the image information; and

20 a code for executing attachment processing of attaching a plurality of different predetermined information to different color components of the image information input by the input processing, respectively.

47. An image processing apparatus, comprising:

25 generation means for generating a plurality of types of second dot patterns corresponding to a first region smaller than a size of a first dot pattern representing predetermined information; and

embedding means for selectively embedding the plurality of types of second dot patterns in units of first regions.

48. The apparatus according to claim 47, further
5 comprising discrimination means for discriminating characteristics of image information in the first region, wherein

10 said embedding means selectively embeds the plurality of types of second dot patterns in units of first regions in accordance with a discrimination result from said discrimination means.

49. The apparatus according to claim 47, wherein the second dot pattern is a dot pattern formed from a single line.

15 50. The apparatus according to claim 47, wherein the first dot pattern is formed by combining the second dot patterns.

20 51. The apparatus according to claim 47, wherein said embedding means quantizes the first region to output quantized image information containing the second dot pattern.

25 52. The apparatus according to claim 51, further comprising determination means for determining a quantization condition on the basis of the image information in the first region, the predetermined information, and the second dot pattern, wherein

00000000000000000000000000000000
said embedding means quantizes the first region on the basis of the determined quantization condition.

53. The apparatus according to claim 51, wherein the quantization is executed by pseudo-halftoning processing using error diffusion.

54. The apparatus according to claim 48, wherein said discrimination means discriminates a quantization error previously generated in the first region by said embedding means.

10 55. The apparatus according to claim 48, wherein said discrimination means discriminates a type of the second dot pattern previously embedded by said embedding means.

56. The apparatus according to claim 48, wherein said embedding means inhibits embedding the second dot pattern when it is determined on the basis of the discrimination result from said discrimination means that the first region has a predetermined density.

15 57. An image processing method, comprising:
a generation step of generating a plurality of types of second dot patterns corresponding to a first region smaller than a size of a first dot pattern representing predetermined information; and
20 an embedding step of selectively embedding the plurality of types of second dot patterns in units of first regions.

25 58. A computer-readable memory, comprising:

a code for generating a plurality of types of second dot patterns corresponding to a first region smaller than a size of a first dot pattern representing predetermined information; and

5 a code for selectively embedding the plurality of
types of second dot patterns in units of first regions.

59. An image processing apparatus for multiplexing image information and additional information different from the image information, comprising:

10 decodability determination means for determining
whether decoding is possible when a code is attached on
the basis of a pixel value around a pixel of interest
in the image information;

quantization condition determination means for
15 determining quantization condition on the basis of a
determination result from said decodability
determination means, the pixel value around the pixel
of interest in the image information, and the
additional information to be multiplexed; and

20 quantization means for quantizing the pixel of
interest in the image information by pseudo-halftoning
processing under the quantization condition determined
by said quantization condition determination means.

60. The apparatus according to claim 59, wherein said
25 decodability determination means determines
decodability in accordance with an image density around

the pixel of interest.

61. The apparatus according to claim 59, wherein said decodability determination means determines decodability in accordance with a black component 5 density around the pixel of interest.

62. The apparatus according to claim 59, wherein said decodability determination means determines decodability in accordance with edge information around the pixel of interest.

10 63. The apparatus according to claim 59, wherein said quantization means quantizes the pixel of interest by pseudo-halftoning processing based on error diffusion.

64. The apparatus according to claim 60, wherein said quantization means quantizes the pixel of interest by 15 pseudo-halftoning processing based on error diffusion.

65. The apparatus according to claim 61, wherein said quantization means quantizes the pixel of interest by pseudo-halftoning processing based on error diffusion.

66. The apparatus according to claim 62, wherein said 20 quantization means quantizes the pixel of interest by pseudo-halftoning processing based on error diffusion.

67. An image processing method of multiplexing image information and additional information different from the image information, comprising the steps of:

25 determining whether decoding is possible when a code is attached on the basis of a pixel value around a

00000000000000000000000000000000

pixel of interest in the image information and determining quantization condition on the basis of a determination result, the pixel value around the pixel of interest in the image information, and the 5 additional information to be multiplexed; and

quantizing the pixel of interest in the image information by pseudo-halftoning processing under the determined quantization condition.

68. An image processing apparatus for attaching 10 predetermined information to image information, comprising:

determination means for determining detectability of the predetermined information attached to the image information; and

15 attachment means for attaching the predetermined information in accordance with the detectability determined by said determination means.

69. An image processing method of attaching predetermined information to image information, 20 comprising the steps of:

determining detectability of the predetermined information attached to the image information; and

attaching the predetermined information in accordance with the determined detectability.

25 70. A computer-readable storage medium which stores a program for an image processing method of attaching

predetermined information to image information, said program comprising:

5 a code for determining detectability of the predetermined information attached to the image information; and

10 a code for attaching the predetermined information in accordance with the determined detectability.

71. An image processing apparatus, comprising:

15 input means for inputting image information; generation means for generating an amount representing a degree of complexity of the image information; and

20 information attachment means for attaching predetermined information to the image information in accordance with the amount representing the degree of complexity.

25 72. The apparatus according to claim 71, wherein said generation means comprises a degree-of-complexity detection means for detecting the amount representing the degree of complexity of the image from the image information.

73. The apparatus according to claim 72, wherein said degree-of-complexity detection means comprises:

25 pseudo-halftoning processing means for executing pseudo-halftoning processing for the image information;

compression processing means for compressing the image information after the pseudo-halftoning processing; and

compression ratio calculation means for 5 calculating a compression ratio of the image information after the compression processing.

74. The apparatus according to claim 72, wherein said degree-of-complexity detection means comprises:

frequency conversion means for executing 10 frequency conversion for the image information; and average high-frequency power calculation means for calculating an average square-sum of a plurality of high-frequency components of conversion coefficients after the frequency conversion.

15 75. The apparatus according to claim 72, wherein said degree-of-complexity detection means comprises:

frequency conversion means for executing frequency conversion for the image information; and average high-frequency absolute sum calculation 20 means for calculating an average absolute sum of a plurality of high-frequency components of conversion coefficients after the frequency conversion.

76. The apparatus according to claim 71, wherein said information attachment means attaches to the image 25 information the predetermined information different from the image information from said input means by

attaching a dot pattern.

77. The apparatus according to claim 76, wherein said information attachment means controls a region where the information is to be attached, in accordance with 5 the amount representing the degree of complexity of the image information, which is generated by said generation means.

78. The apparatus according to claim 77, wherein said information attachment means controls a total amount of 10 dot pattern to be attached to the image information by decreasing an information area interval for complex image information and by increasing the information area interval for simple image information.

79. An image processing method, comprising:

15 an input step of inputting image information;
a generation step of generating an amount representing a degree of complexity of the image information; and
an information attachment step of attaching 20 predetermined information to the image information in accordance with the amount representing the degree of complexity.

80. A computer-readable storage medium which stores an program for attaching predetermined information to 25 input image information, said program comprising:

a code for executing the input step of inputting

the image information;

a code for executing the generation step of generating an amount representing a degree of complexity of the image information; and

5 a code for executing the information attachment step of attaching predetermined information to the image information in accordance with the amount representing the degree of complexity.

81. An image processing apparatus for superposing 10 additional information different from image information on the image information and outputting the image information, comprising:

input means for inputting the image information; 15 pseudo-halftoning processing means for quantizing a pixel of interest in the image information; and additional information superposition means for selectively superposing a plurality of additional information each having a specific dot pattern in accordance with a density around the pixel of interest 20 processed by said pseudo-halftoning processing means.

82. The apparatus according to claim 81, further comprising generation means for generating, for low- and high-density regions, two types of additional information each having a specific dot pattern, the dot 25 pattern for the high-density region having a pixel interval smaller than that of the dot pattern for the

00826001-000000000000
low-density region.

83. The apparatus according to claim 82, wherein
said generation means generates at least two
types of dot patterns suitable for the respective
5 density levels, and

the pattern for the high-density region has the
pixel interval smaller than that of the pattern for the
low-density region and a pixel density level higher
than that of the pattern for the low-density region.

10 84. The apparatus according to claim 81, wherein
said additional information superposition means
comprises density reference region determination means
for determining a region for measurement of an image
density, and pixel count calculation means for
15 calculating the number of pixels present in the density
reference region, and

20 a predetermined threshold value is compared with
the number of pixels obtained by said pixel count
calculation means, and in accordance with a comparison
result, the plurality of additional information are
selectively superposed.

25 85. The apparatus according to claim 81, wherein
said additional information superposition means
comprises density reference region determination means
for determining a region for measurement of an image
density, and total density value calculation means for

calculating a sum of density levels of pixels present in the density reference region, and

a predetermined threshold value is compared with the value obtained by said total density value

5 calculation means, and in accordance with a comparison result, the plurality of additional information are selectively superposed.

86. An image processing method of superposing additional information different from image information 10 on the image information and outputting the image information, comprising:

an input step of inputting the image information;

a pseudo-halftoning processing step of quantizing a pixel of interest in the image information; and

15 an additional information superposition step of selectively superposing a plurality of additional information each having a specific dot pattern in accordance with a density around the pixel of interest processed in said pseudo-halftoning processing step.

20 87. A computer-readable storage medium which stores a program code for an image processing method of superposing additional information different from image information on the image information and outputting the image information, said program code comprising:

25 a code for the input step of inputting the image information;

00882602000
a code for the pseudo-halftoning processing step of quantizing a pixel of interest in the image information; and

5 a code for the generation step of generating a plurality of additional information each having a specific dot pattern; and

10 a code for the additional information superposition step of selectively superposing the generated plurality of additional information in accordance with a density around the pixel of interest processed in the pseudo-halftoning processing step.

88. An image processing apparatus for attaching predetermined information to image information, comprising:

15 input means for inputting the image information; holding means for holding a plurality of dot patterns having different densities; and

20 attachment means for selectively attaching the dot patterns to the image information in accordance with a density of the image information.

89. An image processing method of attaching predetermined information to image information, comprising:

25 an input step of inputting the image information; a holding step of holding a plurality of dot patterns having different densities; and

an attachment step of selectively attaching the dot patterns to the image information in accordance with a density of the image information.

90. A computer-readable storage medium which stores a
5 program code for an image processing method of
attaching predetermined information to image
information, said program code comprising:

a code for the input step of inputting the image information;

10 a code for the holding step of holding a
plurality of dot patterns having different densities;
and

a code for the attachment step of selectively attaching the dot patterns to the image information in accordance with a density of the image information.

91. An image processing apparatus for multiplexing image information and additional information different from the image information, comprising:

input means for inputting the image information;
20 quantization means for quantizing a pixel of
interest in the image information;

dot pattern holding means for holding a specific dot pattern representing presence of the additional information in advance;

25 attachment position information generation means
for converting the additional information into position

information as an attachment position of the dot pattern;

density detection means for grasping a density state around the attachment position of the dot pattern,
5 which is obtained by said attachment position information generation means; and

additional information superposition means for determining, on the basis of a grasp result by said density detection means, whether the dot pattern is to
10 be attached and superposing the additional information in accordance with a determination result.

92. The apparatus according to claim 91, wherein said density detection means comprises:

density reference region determination/holding
15 means for determining and holding a density reference region for measurement of an image density in advance; and

pixel count calculation means for calculating the number of output processing pixels present in the
20 density reference region held by said density reference region determination/holding means.

93. The apparatus according to claim 92, wherein said pixel count calculation means calculates the number of processing pixels present in the density reference
25 region for all of CMYK components.

94. The apparatus according to claim 93, wherein if a

value obtained by said pixel count calculation means equals a predetermined value for all the CMYK components, said additional information superposition means does not attach the dot pattern.

5 95. The apparatus according to claim 92, wherein said pixel count calculation means calculates the number of processing pixels present in the density reference region for some of CMYK components except a specific component.

10 96. The apparatus according to claim 95, wherein if a value obtained by said pixel count calculation means equals a predetermined value for some components except the specific component, said additional information superposition means does not attach the dot pattern.

15 97. The apparatus according to claim 94, wherein the predetermined value is "0".

98. The apparatus according to claim 96, wherein the predetermined value is "0".

99. The apparatus according to claim 91, wherein said 20 density detection means comprises:

density reference region determination/holding means for determining and holding a density reference region for measurement of an image density in advance; and

25 total quantization value calculation means for calculating a sum of quantization values of processing

pixels present in the density reference region held by said density reference region determination/holding means.

100. The apparatus according to claim 99, wherein said 5 total quantization value calculation means calculates the sum of quantization values of processing pixels present in the density reference region for all of CMYK components.

101. The apparatus according to claim 100, wherein if 10 a value obtained by said total quantization value calculation means equals a predetermined value for all the CMYK components, said additional information superposition means does not attach the dot pattern.

102. The apparatus according to claim 99, wherein said 15 total quantization value calculation means calculates the sum of quantization values of processing pixels present in the density reference region for some of CMYK components except a specific component.

103. The apparatus according to claim 102, wherein if 20 a value obtained by said total quantization value calculation means equals a predetermined value for some components except the specific component, said additional information superposition means does not attach the dot pattern.

25 104. The apparatus according to claim 101, wherein the predetermined value is "0".

105. The apparatus according to claim 103, wherein the predetermined value is "0".

106. The apparatus according to claim 91, wherein said quantization means quantizes the pixel of interest in
5 the image information by pseudo-halftoning processing.

107. The apparatus according to claim 92, wherein said quantization means quantizes the pixel of interest in the image information by pseudo-halftoning processing.

108. The apparatus according to claim 93, wherein said
10 quantization means quantizes the pixel of interest in
the image information by pseudo-halftoning processing.

109. The apparatus according to claim 94, wherein said quantization means quantizes the pixel of interest in the image information by pseudo-halftoning processing.

15 110. The apparatus according to claim 95, wherein said quantization means quantizes the pixel of interest in the image information by pseudo-halftoning processing.

111. The apparatus according to claim 96, wherein said
quantization means quantizes the pixel of interest in
20 the image information by pseudo-halftoning processing.

112. The apparatus according to claim 97, wherein said quantization means quantizes the pixel of interest in the image information by pseudo-halftoning processing.

113. The apparatus according to claim 98, wherein said
25 quantization means quantizes the pixel of interest in
the image information by pseudo-halftoning processing.

114. The apparatus according to claim 99, wherein said quantization means quantizes the pixel of interest in the image information by pseudo-halftoning processing.

115. The apparatus according to claim 100, wherein
5 said quantization means quantizes the pixel of interest
in the image information by pseudo-halftoning
processing.

116. The apparatus according to claim 101, wherein
said quantization means quantizes the pixel of interest
10 in the image information by pseudo-halftoning
processing.

117. The apparatus according to claim 102, wherein
said quantization means quantizes the pixel of interest
in the image information by pseudo-halftoning
15 processing.

118. The apparatus according to claim 103, wherein
said quantization means quantizes the pixel of interest
in the image information by pseudo-halftoning
processing.

20 119. The apparatus according to claim 104, wherein
said quantization means quantizes the pixel of interest
in the image information by pseudo-halftoning
processing.

120. The apparatus according to claim 105, wherein
25 said quantization means quantizes the pixel of interest
in the image information by pseudo-halftoning

processing.

121. An image processing method of multiplexing image information and additional information different from the image information, comprising:

5 a pseudo-halftoning processing step of inputting the image information and quantizing a pixel of interest in the input image information;

a dot pattern holding step of holding a specific dot pattern representing presence of the additional 10 information in advance;

an attachment position information generation step of converting the additional information into position information as an attachment position of the dot pattern;

15 a density detection step of grasping a density state around the attachment position of the dot pattern; and

an additional information superposition step of determining, on the basis of a result obtained in said 20 density detection step, whether the dot pattern is to be attached.

122. An image processing apparatus for attaching predetermined additional information to image information, comprising:

25 input means for inputting the image information; holding means for holding the additional

information;

detection means for detecting a density of the image information, which is represented by a plurality of color components of the image information around an attachment position of the additional information; and

control means for, when the density of the image information, which is represented by the plurality of color components and detected by said detection means, has a predetermined value, controlling not to attach the additional information.

123. An image processing method in an image processing apparatus which has holding means for holding additional information and attaches predetermined additional information held by the holding means to image information, comprising the steps of:

detecting a density of the image information, which is represented by a plurality of color components around an attachment position of the additional information in the image information to be processed, and when the detected density of the image information, which is represented by the plurality of color components, has a predetermined value, controlling not to attach the additional information.

124. A computer-readable storage medium which stores a
25 program for an image processing method in an image
processing apparatus which has holding means for

00000000000000000000000000000000

holding additional information and attaches predetermined additional information held by the holding means to image information, said program comprising:

- 5 a code for executing processing of detecting a density of the image information, which is represented by a plurality of color components around an attachment position of the additional information in the image information to be processed, and when the detected density of the image information, which is represented by the plurality of color components, has a predetermined value, controlling not to attach the additional information.
- 10

125. An image processing apparatus for superposing additional information different from image information on the image information and outputting the image information, comprising:
- 15

- input means for inputting the image information;
- 20 pseudo-halftoning processing means for quantizing a pixel of interest in the image information;
- 25 generation means for generating additional information having a specific dot pattern; and additional information superposition means for superposing the additional information, while maintaining a density around an attachment position of the additional information, in accordance with presence

of a neighboring pixel around the attachment position of the additional information.

126. The apparatus according to claim 125, wherein said generation means calculates position information 5 as the attachment position of the specific dot pattern.

127. The apparatus according to claim 125, wherein said additional information superposition means comprises:

first load means for loading the specific dot 10 pattern;

second load means for loading the attachment position information generated by said generation means;

determination means for, in attaching the 15 specific dot pattern to the image information, determining whether a pixel which is absent on the image information need be newly added; and

off-dot processing means for, when said determination means determines that a new pixel has 20 been added, converting a neighboring pixel around the pixel into an off-dot.

128. The apparatus according to claim 125, wherein said additional information superposition means comprises:

25 first load means for loading the specific dot pattern;

second load means for loading the attachment position information generated by said generation means;

density increase amount calculation means for, in
5 attaching the specific dot pattern to the image information, calculating a density amount which has increased upon attaching the specific dot pattern; and
off-dot processing means for converting, of
pixels present in the region, a pixel corresponding to
10 a value obtained by said density increase amount calculation means into an off-dot.

129. The apparatus according to claim 128, wherein
said off-dot processing means comprises:

distance measurement means for measuring a
15 distance to each pixel in the region; and
off-dot processing means for sequentially
converting pixels having a density corresponding to the
value obtained by said density increase amount
calculation means in ascending order of distances
20 obtained by said distance measurement means.

130. The apparatus according to claim 128, wherein
said off-dot processing means comprises:

off-dot processing order determination means for
determining in advance an order of deletion of pixels;
25 and

off-dot processing means for converting pixels

having a density corresponding to the value obtained by said density increase amount calculation means in accordance with the off-dot processing order determined by said off-dot processing order determination means.

5 131. An image processing method of superposing additional information different from image information on the image information and outputting the image information, comprising:

an input step of inputting the image information;
10 a pseudo-halftoning processing step of quantizing a pixel of interest in the image information;
a generation step of generating additional information having a specific dot pattern; and
an additional information superposition step of
15 superposing the additional information while maintaining a density around an attachment position of the additional information in accordance with presence of a neighboring pixel around the attachment position of the additional information.

20 132. A computer-readable storage medium which stores a program code for an image processing method of superposing additional information different from image information on the image information and outputting the image information, said program code comprising:

25 a code for the input step of inputting the image information;

00000000000000000000000000000000
a code for the pseudo-halftoning processing step
of quantizing a pixel of interest in the image
information;

a code for the generation step of generating
5 additional information having a specific dot pattern;
and

a code for the additional information
superposition step of superposing the additional
information while maintaining a density around an
10 attachment position of the additional information in
accordance with presence of a neighboring pixel around
the attachment position of the additional information.

133. An image processing apparatus, comprising:

input means for inputting image information;
15 holding means for holding predetermined
additional information;
attachment means for attaching the predetermined
additional information to the image information in
units of pixels; and

20 adjustment means for adjusting a density of the
image information around an attachment position of the
additional information in accordance with a density of
the additional information.

134. An image processing method, comprising:

25 an input step of inputting image information;
a holding step of holding predetermined

additional information;

an attachment step of attaching the predetermined additional information to the image information in units of pixels; and

5 an adjustment step of adjusting a density of the image information around an attachment position of the additional information in accordance with a density of the additional information.

135. A computer-readable storage medium which stores a 10 program code for an image processing method, said program code, comprising:

· a code for the input step of inputting image information;

15 a code for the holding step of holding predetermined additional information;

a code for the attachment step of attaching the predetermined additional information to the image information in units of pixels; and

20 a code for the adjustment step of adjusting a density of the image information around an attachment position of the additional information in accordance with a density of the additional information.